Zooplankton Abundance and Size in British Columbia Lakes Sampled by the Lake Enrichment Program in 1979

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May 1986

Canadian Data Report of Fisheries and Aquatic Sciences No. 588

86-04251/

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and Aquatic Sciences No. 588

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ZOOPLANKTON ABUNDANCE AND SIZE IN BRITISH COLUMBIA LAKES SAMPLED BY THE LAKE ENRICHMENT PROGRAM IN 1979

by

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Cat. No. Fs97-13/588E ISSN 0706-6465

Correct citation for this publication:

Rankin, D. P. and J. E. Radziul. 1986. Zooplankton abundance and size in lakes sampled by the lake enrichment program in 1979. Can. Data Rep. Fish. Aquat. Sci. 588: 180 p.

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ABSTRACT

Rankin, D. P. and J. E. Radziul. 1986. Zooplankton abundance and size in lakes sampled by the lake enrichment program in 1979. Can. Data Rep. Fish. Aquat. Sci. 588: 180 p.

Zooplankton samples were collected from 21 lakes in 1979. The purpose of the sampling was to collect data on zooplankton abundance, size and species composition from fertilized lakes and lakes being considered for fertilization under the federal-provincial Salmonid Enhancement Program.

RESUME

Rankin, D. P. and J. E. Radziul. 1986. Zooplankton abundance and size in lakes sampled by the lake enrichment program in 1979. Can. Data Rep. Fish. Aquat. Sci. 588: 180 p.

Des échantillons de zooplancton ont été prélevés dans 21 lacs en 1979. Il s'agissait de recueillir des données sur l'abondance, la taille et la composition des espèces de zooplancton dans les lacs fertilisés et les lacs que l'on envisage de fertiliser dans le cadre du Programme fédéral-provincial de mise en valeur des salmonidés.

INTRODUCTION

Samples of zooplankton have been collected from a variety of lakes in British Columbia in each year since 1977 and from lakes in the Yukon in 1977 and 1983 (see previous reports by Rankin, Ashton and Kennedy 1983, 1984). These samples have been collected as part of the Lake Enrichment Program's studies on the use of nutrient additions to oligotrophic lakes as an enhancement technique for sockeye salmon (Stockner and Hyatt 1984 reviewed the objectives and progress of lake enrichment in the Pacific Northwest). The general purpose of these sampling efforts is to provide data concerning zooplankton abundance, species and size composition in a wide range of sockeye salmon nursery lakes. Information on zooplankton is used to assess, in part, a given lake's suitability for treatment to increase zooplankton food supplies potentially available to juvenile sockeye. During years in which the lake is treated these same data are required as indicators of treatment effects and their potential impact on sockeye growth and survival.

A complete record of the methods and results associated with the analysis of the 1979-80 zooplankton samples has not been produced to date and this is the focus for two reports, the present one and Rankin and Radziul (in prep.).

MATERIALS AND METHODS

The locations of the lakes samples are given in Table 1. Zooplankton vertical hauls in mid-lake (1 per station) were taken from a float-equipped DeHavilland of Canada "Beaver" aeroplane using a dark 100-um S.C.O.R. net (mouth area = 0.25 m^2). Station locations are given by Costella et al. 1982. The samples were generally taken between 0900 and 1200 h. The net was hauled from 25 m (in most lakes) or 50 m to the surface at approximately 0.5 $m.s^{-1}$. After each haul, the net was rinsed and the sample removed and preserved in a 4% formaldehyde-sucrose solution (Haney and Hall 1973). The filtration coefficient of the net was assumed to be 1.0. The number of trips to each lake and the number of sampling stations on each lake are given in Table 3.

Biomass was measured by the following procedure. Each sample was halved using a Folsom plankton splitter. One-half of the sample was filtered onto a pre-dried, pre-weighed 0.45 um Millipore filter, dried at 90°C for 24 h and its weight recorded as $mg.m^{-3}$. No effort was made to remove large, rare organisms (e.g. chironomid larvae, mysids etc.) that may have added to the weight. This technique is not useful when the samples contain a large amount of algae (usually diatoms). These samples are indicated in Tables 2-24. In these cases all the lengths of all the animals in the subsample were recorded. Wet weights were calculated based on length-weight relationships given in Appendix table 1. Dry weights were then calculated after correlating calculated wet weights and dry weights from 129 uncontaminated samples (r^2=0.7628). The "corrected" values appear in Tables 2-24.

Due to budgetary and manpower restrictions the methods used to analyse zooplankton samples in 1979, 1980 were simplified considerably compared to those used in other years. Prior to 1979 a manual system involving a high degree of effort and expertise in zooplankton species identification was used (e.g. Rankin et al. 1979, 1983). After 1980 an electronic data processing system using a micro computer was installed greatly reducing the effort required to process zooplankton samples. This system was similar to that described by Sprules et al. (1981). The methods used to generate the following data are described below. In the laboratory, an aliquot (usually 1/4 of a sample) was diluted to 300 ml in a round-bottom flask. Four 3 mL subsamples were taken from the flask with an automatic pipette after first thoroughly mixing the contents of the flask. The four subsamples were processed separately under moderate magnification (500 X) but the counts were pooled. The subsampling technique is a modification of earlier techniques in which one subsample (1/150 or 1/50 to 1/100) of the total sample was taken (Rankin et al. 1979; LeBrasseur and Kennedy 1971). The four subsamples pooled generally represented 1/100 of the total sample. We felt that the pooled subsamples were a better representation of the total sample than a single subsample (1/400). An estimation of the variation in the subsampling technique in determining the population size of a group of organisms is provided in Appendix Table 2. Zooplankton were identified to genus, and counted. The lengths of the first 25 zooplankton[1] in each category, except copepod nauplii and rotifers, were measured. Copepods were categorized as adult male or female or copepodite. Length was measured, along the dorsal axis, from the head to the base of the urosome in Calanoids and to the base of the caudal setae in cyclopoids. Calanoid carapace lengths were later converted to total length (i.e. to the base of the caudal setae) using the following formulae:

Diaptomids

Total length (micrometer units) = (metasomal length/0.691)-1.350
R^2=0.981, n=74

Epischura

Total length (micrometer units)=(metasomal length/0.657)-1.752
R^2=0.953, n=50.

Cladoceran length was measured from the head to the base of the tail spine or mucro, along the lateral axis. Lengths were determined using an ocular micrometer and were later converted to microns.

The data are reproduced here in 2 sets of tables. The first set gives dry biomass, crustacea and rotifer numbers. The second set presents mean length (microns), number measured, standard error of length, density (number per cubic metre) and the standard error of the density estimate.

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[1]Initially the first 50 zooplankton were measured and these data appear periodically in the tables.

ACKNOWLEDGMENTS

In 1979, the samples were collected by Lake Enrichment staff.

The samples were processed in 1980 by M. Sullivan of L. G. L. Limited (Sydney, B.C.). The data were verified by T. Cone (MacLaren Plansearch Corp.).

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